

What is claimed is:

1           1. A method for displaying a predictively coded compressed video signal  
2 in a reverse time sequence comprising the steps of:

3           decoding and storing any I-frames and P-frames from a first group of pictures  
4 (GOP) upon initiation of a reverse play command; and

5           after storing the decoded I-frames and P-frames from the first GOP, displaying  
6 video images from the first GOP in the reverse time sequence, including the steps of:

7           decoding any bidirectionally predictively encoded frames (B-frames)  
8 using the stored I-frames and P-frames and displaying the B-frames as they are  
9 decoded;

10           displaying the stored I-frames and P-frames of the first GOP as they  
11 are encountered in the reverse time sequence; and

12           while displaying the I-frames and the P-frames, decoding and storing  
13 respective I-frames and P-frames from a second GOP, following the first GOP in the  
14 reverse time sequence.

1           2. A method according to claim 1 wherein:

2           the step of decoding and storing the I-frames and P-frames includes the step of  
3 downsampling the decoded I-frames and P-frames to produce respective downsampled I-  
4 frames and P-frames and storing the downsampled I-frames and P-frames;

5           the step of decoding the B-frames includes the step of filtering the decoded B-  
6 frames to display a reduced-resolution image; and

7           the step of displaying the I-frames and the P-frames includes the step of  
8 upsampling the stored I-frames and P-frames to provide respective reduced-resolution images  
9 for display.

1                   3.     A method according to claim 1, wherein the predictively coded  
2     compressed video signal is an MPEG compressed video signal and the steps of decoding I-  
3     frames and P-frames include the step of applying an MPEG decoding process.

1                   4.     A method for displaying an MPEG coded compressed video signal in a  
2     reverse time sequence comprising the steps of:

3                   retrieving a first group of pictures (GOP) upon initiation of a reverse play  
4     command, the retrieved first GOP being the GOP displayed immediately preceding the  
5     command;

6                   decoding any I-frames and P-frames of the first GOP and storing them in a  
7     memory;

8                   displaying the decoded I-frames and P-frames of the first GOP as the I-frames  
9     and P-frames are encountered in the reverse time sequence;

10                  10     constructing and displaying any B frames of the first GOP as the B-frames are  
11     encountered in the reverse time sequence; and

12                  12     decoding I-frames and P frames of a second GOP and storing the decoded I-  
13     frames and P-frames of the second GOP in the memory, the second GOP being a next  
14     preceding GOP, wherein each I-frame and P-frame of the second GOP is decoded while a  
15     respective one of the I-frames and P-frames of the first GOP is being displayed.

1                   5.     A method according to claim 4 wherein:

2                   the step of decoding and storing the I-frames and P-frames of the first GOP  
3     includes the step of downsampling the decoded I-frames and P-frames of the first GOP to  
4     produce downsampled key frames and storing the downsampled key frames;

5                   the step of decoding the B-frames includes the step of filtering the decoded B-  
6     frames to display a reduced-resolution image; and

7                   the step of displaying the I-frames and the P-frames includes the step of  
8   upsampling the stored I-frames and P-frames to display respective reduced-resolution images.

1                   6.       Apparatus which displays a predictively coded compressed video signal  
2   in a reverse time sequence comprising:

3                   a video decoder which decodes intra-coded frames (I-frames) and predictively  
4   coded frames (P-frames) from a first group of pictures (GOP) upon initiation of a reverse  
5   play command;

6                   a memory into which the video decoder stores the decoded I-frames and P-  
7   frames of the first GOP;

8                   means for displaying a frame stored in memory while the I-frames and P-  
9   frames of the first GOP are decoded; and

10                  a controller that controls the video decoder, the memory and the means for  
11   displaying such that, after the decoded I-frames and P-frames of the first GOP have been  
12   stored, the controller:

13                  a) controls the video decoder to decode bidirectionally predictively  
14   encoded frames (B-frames) using the stored key frames and controls the means for  
15   displaying to display the B-frames as they are decoded;

16                  b) controls the means for displaying to display the I-frames and P-  
17   frames from the memory as they are encountered in the reverse time sequence; and

18                  c) controls the decoder and the memory to decode and store I-frames  
19   and P-frames from a second GOP, following the first GOP in the reverse time  
20   sequence, while respective ones of the I-frames and P-frames of the first GOP are  
21   displayed.

1                   7.       Apparatus according to claim 6 further including:

2                   a filter, coupled to the decoder for generating respective reduced-resolution  
3                   versions of the decoded I-frames, P-frames and B-frames; and

4                   a downampler which decimates the reduced-resolution versions of the  
5                   decoded I-frames and P-frames before the I-frames and P-frames are stored in the memory.

1                   8.       Apparatus for displaying a predictively coded compressed video signal  
2                   in a reverse time sequence comprising:

3                   means for decoding and storing any I-frames and P-frames from a first group  
4                   of pictures (GOP) upon initiation of a reverse play command; and

5                   means for displaying video images from the first GOP in the reverse time  
6                   sequence, including:

7                   means for decoding any bidirectionally predictively encoded frames (B-  
8                   frames) using the stored I-frames and P-frames and for displaying the B-frames as they are  
9                   decoded;

10                  means for displaying the stored I-frames and P-frames of the first GOP  
11                  as they are encountered in the reverse time sequence; and

12                  means for decoding and storing I-frames and P-frames from a second  
13                  GOP, following the first GOP in the reverse time sequence, while the means for displaying  
14                  the stored I-frames and P-frames displays respective ones of the I-frames and the P-frames of  
15                  the first GOP.

1                   9.       Apparatus according to claim 8 wherein:

2                   the means for decoding and storing the I-frames and P-frames includes means  
3                   for downsampling the decoded I-frames and P-frames to produce respective downsampled I-  
4                   frames and P-frames and means for storing the downsampled I-frames and P-frames;

5                   the means for decoding the B-frames includes filtering means for filtering the  
6    decoded B-frames to display a reduced-resolution image; and

7                   means for displaying the I-frames and the P-frames includes upsampling  
8    means for upsampling the stored downsampled I-frames and P-frames to provide respective  
9    reduced-resolution images for display.

1                   10.    A computer-readable carrier including computer program instructions  
2    that cause a computer to perform a method of displaying an MPEG coded compressed video  
3    signal in a reverse time sequence, the method comprising the steps of:

4                   retrieving a first group of pictures (GOP) upon initiation of a reverse play  
5    command, the retrieved first GOP being the GOP displayed immediately preceding the  
6    command;

7                   decoding any I-frames and P-frames of the first GOP and storing them in a  
8    memory;

9                   displaying the decoded I-frames and P-frames of the first GOP as the I-frames  
10   and P-frames are encountered in the reverse time sequence;

11                  decoding and displaying any B frames of the first GOP as the B-frames are  
12    encountered in the reverse time sequence; and

13                  decoding I-frames and P frames of a second GOP and storing the decoded I-  
14    frames and P-frames of the second GOP in the memory, the second GOP being the next  
15    preceding GOP, wherein each I-frame and P-frame of the second GOP is decoded while a  
16    respective one of the I-frames and P-frames of the first GOP are being displayed.

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